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ABSTRACT

Using 10 kindergarten children with poor articulation of /s/, this study sought to determine whether modification of speech sounds by the use of an electroacoustic filter improved the children's /s/ articulation, as compared to training of /s/ using non-filtered words. Posttest scores, as measured by "A Deep Test of Articulation," showed a significant improvement for some members of the experimental group over their pretest scores, while the control group made little or no improvement. The study was intended to encourage speech-language pathologists and researchers to explore the potential effectiveness of such a filter in remediation training of misarticulated sounds. A list of suggestions for future research is provided. (JDD)

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USE OF A FILTERED SPEECH MODEL IN ARTICULATION THERAPY

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Abstract: Type the abstract, **double-spaced** in the space below. Do not exceed 75 words for technical/traditional, poster, videotape sessions. For miniseminar or short courses, do not exceed 150 words, and use a continuation page. Prepare abstract carefully, as it may not be edited before publication.

Ten kindergarten and first grade children with poor articulation of /s/ were randomly divided into: (1) Control group who received speech models of unaltered /s/ words; and (2) Experimental group who received speech models of filtered /s/ words during articulation therapy. Significant improvements in A Deep Test of Articulation scores were observed in the post-test for the experimental group. The results suggest that acoustic modification of speech sounds by an electroacoustic filter may be a viable supplement to existing articulation remediation.

Background

The importance of accurate auditory perception of speech sounds for the facilitation of their correct production is widely recognized in many remedial approaches for articulation disorders (Backus and Beasley, 1956; Berry and Eisenson, 1956; Cohen and Diehl, 1963; Gerber, 1973; Hodson and Paden, 1983; McCabe and Bradley, 1975; McDonald, 1964; McReynold and Bennet, 1972; Milisen et al., 1954; Powers, 1971; Sherman and Gieth, 1967; and West, Ansberry and Carr, 1957). For example, Hodson and Paden (1983) argue that the vast majority of children rely completely upon auditory cues for speech perception and develop normal speech without specific instruction on placement of articulators. They postulate that a child with faulty articulation may require more auditory stimulation than usual. Van Riper (1975) and Winitz (1973) further purport that a child who perceives a sound incorrectly cannot be expected to produce that sound correctly.

It has been well documented in the field of telecommunication and signal processings for hearing aid fitting that different filterings of a sound can result in different sound recognition of that same sound. Applying such principles, Black (1968), Renard (1975), and Spletzer and Asp (1981) have proposed the use of an electroacoustic filter in articulation therapy in order to facilitate the auditory perception of speech sounds. They found that a specific octave band is optimal for the perception of each phoneme and thus leads to maximum intelligibility for the production of that particular phoneme.

The present study attempted to improve the articulation of a target sound by altering its acoustic characteristics through an electroacoustic filer. The specific goal of the study was to determine whether articulation training of /s/ using filtered words improves the articulation of /s/ as compared to articulation training of /s/ using non-filtered words.

Procedures

Ten kindergarten children were selected as subjects from local elementary schools and met the following criteria: (1) five to six years of age; (2) normal hearing as measured at 20 dB HL for the frequencies of 1000, 2000, and 4000 Hz (Asha, 1975); (3) misarticulation of /s/ in at least 80% of their productions in the arresting and releasing positions as measured by A Deep Test of Articulation (McDonald, 1964); (4) mildly-impaired articulation as measured by the Goldman Fristoe Test of Articulation (Goldman and Fristoe, 1972); (5) falling within the 50th percentile or above on the Northwestern Syntax Screening Test (Lee, 1971); (6) no anterior occlusion problems or missing incisors as examined by the experimenter; and (7) average or better academic performance in school as reported by their teachers. These ten children were then randomly divided into two groups: (1) Control group who received articulation training with non-filtered (unaltered) /s/ words; and (2) Experimental group who received training with filtered /s/ words. A Deep Test of Articulation (McDonald, 1964) was administered as a pre- and post-test and the test results were analyzed by using a two-way

analysis of variance with repeated measures on one factor.

Three lists of 20 words (16 one-syllable and 4 two-syllable words) in which the phoneme /s/ was placed in the arresting and releasing positions of the words that were developed as training items. Each 20-item list consisted of five words in each of the following four categories: (1) consonant + /s/ (Cs); (2) /s/ + consonant (sC); (3) vowel + /s/ (Vs); and (4) /s/ + vowel (sV). Each training word was spoken once by a female adult speaker and recorded on a tape recorder through both non-filtered and filtered (i.e., 600 Hz low pass and 6400-12,500 Hz band pass) conditions.

Present Audio Tape Here

Articulation training was given to each child individually, and was accomplished by presenting each word via headsets from the tape recorder three times in a stimulus-response-feedback format. The control group received a list of non-filtered words, while the experimental group received a list of filtered words (the same words used with the control group). The presentation level was set to the child's most comfortable listening level which was about the same intensity (approximately 60 dB SPL) across all the subjects. The subject received positive or negative feedback as to the accuracy of each response, i.e., "good", "okay", "almost", for a correct response; and "no, try again", for an incorrect response. However, they did not receive instruction on how to produce /s/ correctly. A twenty-minute

session was given twice per week over a three-week period.

Results and Discussion

The present study was never designed to make any definitive conclusion regarding the use of a filter in articulation therapy nor to propose a single novel device to remedy the misarticulation of sounds. The primary intent of the study was rather to encourage speech-language pathologists and researchers in the field to explore its potential effectiveness in remediation of misarticulated sounds. In that regard, the results were encouraging.

Present Figure 1 Here

The mean post-test score of the experimental group who was trained using the filtered words showed a significant improvement as compared to its pre-test score.

An examination of individual scores revealed that subjects 6, 7, and 10 in the experimental group made considerable improvement while subjects 8 and 9 in the experimental group and all subjects in the control group made little or no improvement. It is possible that the use of filtered /s/ words may be effective in articulation remediation for some children, but not for others.

The results of the study seem to suggest that acoustic modification of speech sounds by the use of an electroacoustic filter during articulation training did help to improve the articulation of /s/ in young normal hearing children with a relatively short period of training (i.e., five 20-minute

sessions with each session given twice per week over a three-week period). It must be cautioned, however, that such a technique may not be applicable nor effective with children as in the case with many other therapeutic methods. A clinician must eventually examine its appropriateness for each case individually.

Suggestions for Future Research

Suggestions for future research are addressed as follows:

1. Future studies may incorporate a larger number of subjects with a wider range of ages.
2. More investigations including a variety of frequently misarticulated sounds must be made in order to examine the effectiveness of such acoustic modification techniques in articulation training.
3. An optimal filter setting for each English phoneme has to be investigated carefully for further applications of filtered speech.
4. The effectiveness of such a technique also should be examined in terms of a rate of improvement during training.
5. Future studies could include subjects with more severely impaired articulation.
6. The use of filtered words could be incorporated in currently existing treatment programs and research should be conducted to study the effectiveness of program modification. For example, the "listening word list" used in the auditory bombardment phase of A

Phonological Approach to Remediation (Hodson and Paden, 1983) could be filtered for optimum auditory stimulation. Filtered target words could be implemented in many treatment approaches.

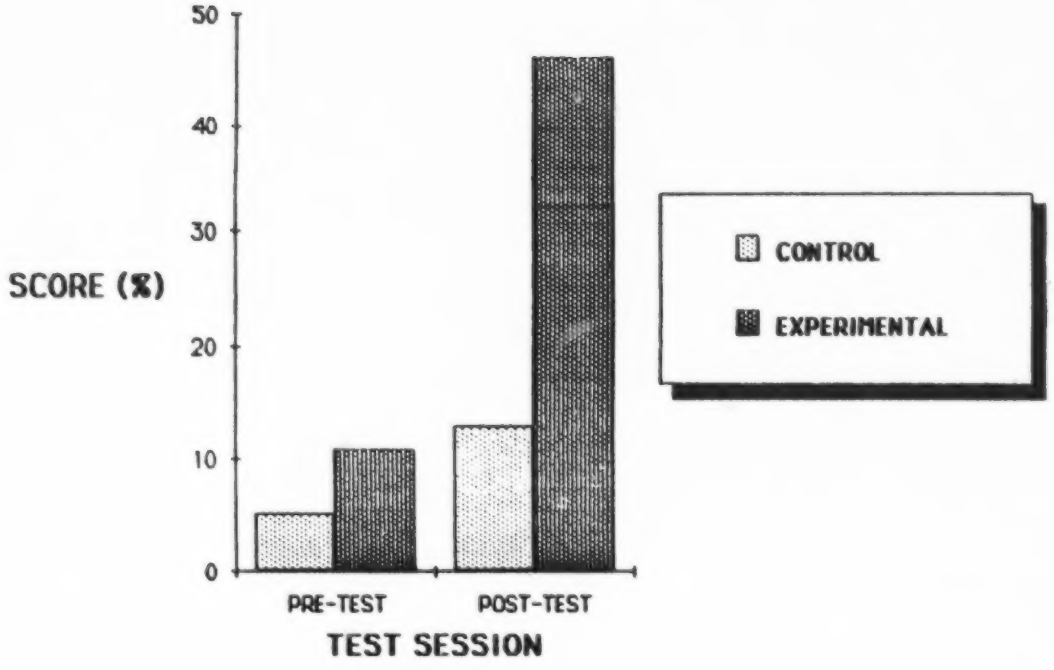

Figure 1. Pre- and post-test scores on A Deep Test of Articulation for the control and experimental groups.